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INSTALLATION MANUAL

This manual applies to the following products: **Day4 Energy 36MC, 48MC, 48MC-S and 60MC-I.**

Please read and study this manual completely before installation or use of any Day4 Energy Inc. (Day4 Energy) photovoltaic modules.

Refers to instructions for Europe installations only

Refers to instructions for USA and Canada installations only

Refers to instructions for 36MC, 48MC & 48MC-S modules only

Refers to instructions for 60MC-I module only

INTRODUCTION

With proper installation, operation and maintenance, Day4 Energy modules will provide you with clean, renewable solar electricity for many years. This manual contains important installation, maintenance and safety information. Retain this manual for future reference. The word "module(s)" as used in this manual refers to one or more Day4 Energy 36MC, 48MC, 48MC-S and 60MC-I photovoltaic modules.

Disclaimer of Liability

Day4 Energy does not assume responsibility and expressly disclaims liability for loss, damage or expense arising out of or in any way connected with installation, operation, use or maintenance by using this manual. Day4 Energy assumes no responsibility for any infringement of patents or other rights of third parties which may result from the use of Day4 Energy modules. No license is granted by implication or under any patent or patent rights. The information in this manual is believed to be reliable, but does not constitute an expressed and/or implied warranty. Day4 Energy reserves the right to make changes to the product, specifications or manual without prior notice and on its sole discretion.

General Information

The installation of photovoltaic Day4 Energy modules requires a great degree of skill and should only be performed by qualified licensed professionals, including, without limitation, licensed contractors and licensed electricians.

WARNING

- All instructions should be read and understood before attempting to install, wire, operate or maintain the photovoltaic Day4 Energy module. Contact with electrically active parts of the module such as terminals can result in burns, sparks and lethal shock whether the module is connected or disconnected.
- Some transformer-less inverters are not suitable for use with photovoltaic modules in specific applications. Check with the inverter manufacturer, the inverter installation manual and attain the inverter manufacturer's approval prior to use.
- The installer assumes the risk of any injury that might occur during installation, including, without limitation, the risk of electric shock and or fire.
- Day4 Energy modules generate DC electrical energy when exposed to sunlight or simulated sunlight sources. Although a single module produces only a low voltage and current, shocks and burns are still a potential risk.
- To avoid the danger of electric shock and injury, cover the front glass surface of the Day4 Energy module with a dense, opaque material during installation and handling.
- The shock hazard increases as Day4 Energy modules are connected in parallel producing higher current. The shock risk increases as modules are connected in series producing higher voltages.
- To avoid the peril of electric shock, work only under dry conditions with dry modules and tools.
- To avoid the risk of injury and damage to the module, do not stand or step on a Day4 Energy module.
- To avoid the threat of electric shock and/or fire, do not puncture or damage the backsheet of a Day4 Energy module. To avoid the peril of electric shock and injury, children and unauthorized persons should not be allowed near the installation of modules.
- *In Europe* grounding is recommended for Day4 Energy modules.
- *In USA and Canada* it is a requirement to completely ground all Day4 Energy modules.
- To avoid the danger of electric shock, fire and injury, do not disassemble the Day4 Energy module, or remove any part installed by Day4 Energy or any authorized dealer or integrator.
- Unauthorized persons should not open the cover of the junction box as this increases chances of dangerous electric shock, may cause damage to the module and will void the warranty. Only a qualified licensed professional should attempt to open the cover of the junction box.
- To avoid the risk of electric shock or injury, employ suitable clothing and tools to prevent direct contact with solar electric systems with voltage greater than 40V.
- Use caution when carrying Day4 Energy modules. It is recommended that two or more persons carry the module by its frame and use non-slip gloves.
- Do not carry a Day4 Energy module by its connecting wires or junction box.
- Do not drop anything on the surface of a Day4 Energy module. A damaged surface can cause electric shock and injury.
- To avoid the hazard of electric shock and fire, be sure that all system components are compatible with Day4 Energy modules. Components should not subject the module to mechanical or electrical hazards.
- Since sparks may occur, do not install the Day4 Energy module where flammable gases or vapors are present.
- Never leave a Day4 Energy module unsupported or unsecured, especially on elevated places of installation like roofs, buildings and on scaffoldings.
- Do not drop a Day4 Energy module.
- Do not use or install a broken or damaged Day4 Energy module.
- Day4 modules with damaged back-sheets should never be installed or operated.
- To avoid the risk of fire or damage, do not artificially concentrate sunlight on a Day4 Energy module.
- Do not touch the junction box terminals. This can cause electric shock and injury.
- Do not change the wiring of bypass diodes.
- Do not install Day4 Energy modules above flammable material. Special attention needs to be paid when Day4 Energy modules are installed as building integrated product (BIPV).
- Do not remove the frame or parts thereof.
- Do not run reverse current through a Day4 Energy module in an attempt to de-ice the module or for any other purpose.
- Do not stand or walk on the surface of a Day4 Energy module as you may cause damage to the frame or other parts of the module.

CAUTION

- Use a Day4 Energy module for its intended purpose only. (Please refer to the Day4 Energy 36MC, 48MC, 48MC-S and 60MC-I series warranty document.)
- To avoid reduced module functionality, damage, inoperable conditions and other unknown troubles, do not treat the backsheet or front surface with paint or adhesives.
- Do not disconnect connectors under load.

GENERAL SAFETY

Follow all permission, installation and inspection requirements.

- Before installing Day4 Energy modules, contact the appropriate authorities to determine permissions, installation and inspection requirements to be followed.
- Electrically ground Day4 Energy modules for all systems of any voltage *(mandatory in USA and Canada, recommended in Europe).* If not otherwise specified it is recommended that requirements of the latest National Electrical Code (USA) or Canadian Electric Code (Canada) or any other applicable national or international electrical standards be used.
- Be sure that the construction or structure (roof, facade, etc.) where the Day4 Energy modules are being installed has enough strength to support the added module and structure weight. For modules that are to be mounted on roofs, special construction or structures may be required for proper installation. Both roof construction and module installation design have an effect on the fire resistance of a building. Improper installation may contribute to fire hazards. Additional devices such as ground fault, fuses and disconnects may be required.
- Do not use Day4 Energy modules of different specifications (power class, size, etc.) in the same system.
- Follow all safety precautions of other system components used.
- Do not change or alter Day4 Energy modules or apply improper means, such as, but not limited to, mirrors and/or other optical systems of any kind. Do not operate the modules under artificially concentrated sunlight such as an optical system and/or in direct contact with solar thermal systems.

UL Listing Information

(applies to USA and Canada only):

To satisfy UL requirements when installing Day4 Energy modules be sure to:

1. Use only stranded single-conductor wire of listed type USE-2, 12 AWG, rated 90°C, 600 V, sunlight resistant for Day4 Energy modules and interconnect wiring that is exposed to weather.
2. Observe the requirements described in sections of this manual labeled "**Installation**" and "**Specifications**".
3. Grounding of the Day4 Energy module frame is required. When ground wires greater than 6 mm² (No. 10 AWG) are required the installer will need to provide suitable terminal connectors.

IEC 61730 Application Class A Information

(applies to Europe only)

Day4 Energy modules are designed to pass the criteria of application class A requirements according to IEC 61730-part 1.

To satisfy IEC 61730 requirements when installing the Day4 Energy modules be sure to:

1. Use only double insulated stranded copper type cable. The cable should be resistant to UV, water, ozone, fluids, salt, general weathering and abrasion. The cable should be halogen free and flame retardant for the Day4 Energy module and interconnect wiring. Be sure the cable is certified according to IEC 60228 class 5.
2. Observe the requirements described in sections of this manual labeled "**Installation**" and "**Specifications**".
3. Equipotential bonding of the Day4 Energy modules and module frame is recommended. The equipotential bonds between modules may only be connected and approved by a qualified electrician.
   - *Option 1:* Connect the module frame using cables [16 mm² (0.64 in²)] with cable lugs. Use the holes [diameter 4 mm (0.16 in)] for this purpose. To create the conductive connection (frame is anodized), use a self-tapping screw [diameter 5 mm (0.20 in)] or a serrated washer.
   - *Option 2:* Create an electrical connection between the frames and the mounting system by using serrated lock nuts (see "**Installation**", Figure 1 – Example B).
4. Do not apply any external voltage higher than Voc labeled on the module.
5. Refer to the module label for maximum series fuse rating.

INSTALLATION

General

- Please read this guide completely before installation or use of Day4 Energy modules. This section contains electrical and mechanical specifications needed before using your modules.
- Day4 Energy modules should be firmly fixed in place in a manner suitable to withstand all expected loads, including wind and snow loads.
- Do not drill additional mounting holes into module frames, as this will void the warranty.
- Day4 Energy modules must not be fitted as overhead or vertical glazing.
- Day4 Energy modules must be installed in a way that ensures the junction box is in the uppermost position.
- The appropriate material should be used for mounting hardware to prevent the module frame, mounting structure and hardware itself from corrosion.
- Install Day4 Energy modules where they are not shaded by obstacles like buildings and trees. Pay attention to avoid partial shading by objects during the daytime.
- Do not operate the module if it is shadowed or otherwise covered in its entirety or partially by debris, leaves, tree branches, dirt, bird droppings, snow, ice and/or any other substance or objects capable of preventing the light from illuminating the front surface of the module in a uniform unobstructed manner (refer to section in this manual labeled "**Notes on Installation**").
- Do not permanently operate the module if it is shadowed or otherwise covered in its entirety or partially by debris, leaves, tree branches, dirt, bird droppings, snow, ice and/or any other substance or objects capable of preventing the light from illuminating the front surface of the module in a uniform unobstructed manner (refer to section in this manual labeled "**Notes on Installation**").
- Please contact your Day4 Energy authorized representative with questions regarding mounting profiles for modules.

Notes on Installation

- Clearance between the Day4 Energy module frame and the mounting surface is required to allow cooling air to circulate around the back of the module. This also allows any condensation or moisture to dissipate. The module should never be sealed to the mounting surface with sealant preventing air from circulating under the module.

  In Europe only:
  The recommended distance is minimum 50 mm.

  In USA and Canada only: In order to maintain UL Listing, a minimum clearance of 10.16 cm (4 in) is required between module and any installation surface. A minimum slope of 5 inch/ft for installations over a roof is required to maintain the fire class ratings.
- In order to determine the maximum annual yield, the optimum orientation and tilt of the Day4 Energy modules must be identified. Sunlight shining vertically onto the modules will give the best conditions to generate maximum power. To avoid performance drops in series circuits, ensure all modules have the same orientation and tilt. Modules should be of the same power class.
- Even the slightest partial shading, like from dirt deposits, will cause a reduction in yield. A module is considered "shadow-free" if it is un-obscured across its entire surface for the entire year. Even on the shortest day of the year, un-obstructed sunlight should reach the module.
- The recommended standoff height minimum to satisfy the UL fire class C rating is 10.16 cm (4 in). Other mounting methods will affect the fire class rating. The fire class rating of the PV module installation must meet the code requirements as well as the requirements of the specific place of installation.
- Please refer to Figure 1 and Figure 2 for proper installation.

DIODES

Bypass Diodes

Day4 Energy modules in series strings that are partially shaded may cause reverse voltage across cells or modules because current from other cells in the same series is forced to flow through the shaded area. This may cause undesirable heating to occur. The use of a diode to bypass the shaded area can minimize both heating and reduce the array current.

All Day4 Energy modules are equipped with factory installed bypass diodes. The factory installed diodes provide proper circuit protection for the systems within the specified system voltage so that no other additional bypass diodes are required. Contact your authorized Day4 Energy representative for the proper diode type if it is necessary to add or change diodes due to system specifications.

WIRING

General

All wiring methods should be in accordance with the NEC in USA or CEC in Canada or any other code, electrical code, law or bylaw applicable for the place of installation.

- All wiring should be completed by a qualified licensed professional.
- Wiring should be protected to help ensure personal safety and to prevent damage.
- All Day4 Energy modules connected in series should be of the same model class and/or type.
- Do not connect Day4 Energy modules in parallel without using a connection box.
- Cable used for any wiring should be sized according to applicable electrical codes.
- Any cable used in the installation should conform to the requirements of IEC 60228 class 5 *(Europe only)*.

Day4 Energy Module Wiring

- The maximum number of Day4 Energy modules that can be wired in series or parallel design is dependent on legal requirements, maximum current and voltage ratings as indicated on the module label, installation design, space and further specifications of additional equipment such as inverters and converters.
- Day4 Energy modules must have the same amperage when connected in series. When connected in parallel, the modules must have the same voltage. The modules must not be connected together to create a voltage higher than the permitted system voltage according to protection class A.
- The Day4 Energy modules can be used for off-grid installations, like charging batteries, if electronic equipment such as a power tracker is used to control module output parameters and provides accurate electrical output according to off-grid appliance specifications.
- Please contact your local licensed installer regarding the use of Day4 Energy modules in off-grid applications and in combination with charge controllers or similar equipment.
- Day4 Energy modules contain factory installed bypass diodes. If these modules are incorrectly connected to each other the bypass diodes, cables or junction boxes may be damaged.

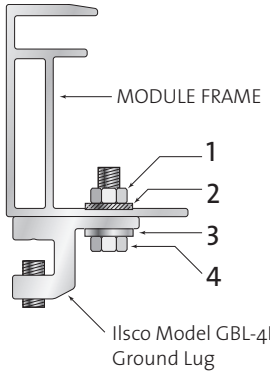
Array Wiring

The term "array" is used to describe the assembly of several Day4 Energy modules on a support structure with associated wiring. Use insulated copper wire that is suitable for outdoor use and is insulated to withstand the maximum possible system open circuit voltage. Check local codes for further requirements.

Earth Ground Wiring

Ground should be carried out by securing the Day4 Energy module or array frame to avoid the hazards of electric shock or fire. The array frame should be grounded in accordance with NEC Article 250 *(USA)*. Installations in Canada shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, CEC part 1. Contact local authorities to determine the necessary grounding code requirements.

Proper grounding is achieved by connecting the module frames and structural members contiguously together using a suitable "grounding conductor." It is recommended to utilize a UL listed grounding lug made of stainless steel. Use a tin-plated or beryllium grounding lug if the grounding method involves attachment of a grounding lead to the module frame.



1 6-32 stainless steel nut
2 #6 stainless steel star washer
3 #6 stainless steel washer
4 6-32 stainless steel screw

The grounding conductor, grounding lead, or strap may be copper, copper alloy, or another material acceptable for use as an electrical conductor per NEC/CEC. The grounding conductor must make a connection to earth using a suitable earth ground electrode. Ensure positive electrical contact through the anodizing on the module's frame by utilizing one of the following grounding methods:

Attach the grounding conductor:

1. To one of the 4 mm (0.16 in) holes marked 'ground' with a nut, bolt or screw assembly and a serrated washer, external toothed washer, or a paint piercing washer for attachment of the grounding lug to the Day4 Energy module frame.
2. To electrically conductive metal, such as that of a support structure which has been bonded to the module frame through a bonding or external tooth washer, or a welded, or a soldered for brazed joint or other suitable means as described above.
3. With two or more screws or two full threads of a single screw engaging the module frame metal.

Attention: Do not allow dissimilar metals such as copper and aluminum to come in contact with each other. Use grounding lugs made of stainless steel, beryllium or tin-plated. Never use self-tapping screws to connect the grounding conductor.

Day4 Energy Module Terminations

A junction box as a terminal enclosure is equipped for electrical connections on Day4 Energy modules. Day4 Energy modules are equipped with industry proven interconnection systems in either UL or IEC compliant versions, output cables, and male and female cable couplers. Use the couplers for electrical connections only.

Please refer to module data sheet and contact your Day4 Energy authorized representative with questions regarding electrical connections for Day4 Energy modules.

Junction Box and Terminals

Day4 Energy modules are equipped with one junction box with terminals for both positive and negative polarity and bypass diodes.

One terminal is dedicated to each polarity with the polarity symbols engraved onto the terminals or junction box.

No modifications to the junction box are permitted.

Conduit

For applications where wire conduits are used, follow the applicable codes for outdoor installation of wires in conduits. Verify that all fittings are properly installed to protect wires against damage and prevent moisture intrusion.

STANDARD OPERATING CONDITIONS

It is recommended that Day4 Energy modules be operated under **"Standard Operating Conditions"** (SOC).

An installation location with conditions different from SOC or with other **"Special Conditions"** (see below) should be avoided. SOC of Day4 Energy modules are as follows:

1.) Standard Operating Conditions

- The Day4 Energy module should be operated only in terrestrial applications. No space or other "**Special Conditions**" (see below).
- The operating temperature of the module should be within -35°C (-31°F) to 90°C (194°F).
- The relative humidity should be within 45% to 85%.
- Installations have to be carefully reviewed in regards to wind loads. Appropriate installation methods must be used. If wind loads higher than 2400N/m² are expected, contact Day4 Energy for further information.

2.) Special Conditions

- Operating temperature and installation place conditions are different from SOC.
- The salt damage is extreme at the installation location.
- The local climate generates snow accumulations heavier than 2400N/m² for extended periods of time which are not regularly removed by authorized personnel.
- The local climate generates hail storms with hailstones larger than 20 mm in diameter.
- The local climate generates sand and dust storms on more than three days/year.
- The air pollution, chemically active vapors, acid rain, soot, or other pollutants are extreme at the installation location. In areas with higher than normal concentration of gases like C_xH_y, NH_3, H_2S, Day4 Energy shall be consulted upon special installation requirements not covered by this installation manual.

MAINTENANCE

Some maintenance is recommended to maintain optimal output performance of the Day4 Energy modules. If the module surface becomes dirty, it may reduce output power. It is recommended to clean the surface of the module with plenty of water and a soft cloth or sponge. A mild non-abrasive detergent may be applied for persistent dirt. Never scratch or rub away any dirt when dry. Do not use a high pressure cleaner or automated cleaning equipment.

It is also recommended to inspect the Day4 Energy module's electrical and mechanical connections annually. All fastenings should be tight and secure and free of corrosion. All cable connections should be secure, tight, clean and free of corrosion. Cables may not be damaged in any way. Take care that the lid of the junction box is tightly secured and electrical connectors are properly connected and free of corrosion.

To avoid the risk of electric shock and/or injury, it is recommended an authorized professional carry out the electrical and/or mechanical inspection and/or maintenance is required.

If modules are stored prior to installation, ensure that no water, dirt, dust, etc. accumulates on the module's back side. The contacts and the junction box especially, must be kept free of any moisture. Inside storage is strongly recommended.

The return of any Day4 Energy module will not be accepted by Day4 Energy unless prior written authorization has been given by Day4 Energy.

As part of our policy of continuous improvement, Day4 Energy reserves the right to change product specifications at any time without prior notice and at its sole discretion.

SPECIFICATIONS

Notes on Specification

- Rated electrical characteristics are within 3.5% of the values measured at Standard Test Conditions (STC). STC are: Irradiance of 1000 W/m², 25°C cell temperature and solar spectral irradiance per IEC 60904-3 (AM1.5 solar spectral irradiance).
- The current output for the Day4 Energy modules is shown in the Specifications as measured at Standard Test Conditions. These conditions may not be frequently observed in actual practice.
- Under normal conditions a Day4 Energy module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of Isc and Voc marked on listed module should be multiplied by a safety factor of 1.25 when determining voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the module output.

Electrical ratings at STC:

Maximum system voltage rating:

Europe: IEC 61215/IEC61730 rating = 1000V

USA and Canada: UL 1703 rating = 600V

Day4 36MC Series Modules

P_{max} (U_{mpp}*I_{mpp}) (W)	Maximum Power Voltage (V)	Maximum Power Current (A)	Short Circuit Current (A)	Open Circuit Voltage (V)
115	16.80	6.89	7.60	20.98
120	16.95	7.08	7.70	21.23
125	17.21	7.30	7.90	21.52
130	17.55	7.46	8.05	21.90
135	17.78	7.60	8.10	22.05
140	17.98	7.79	8.20	22.28
145	18.24	7.95	8.30	22.57

Day4 48MC Series Modules

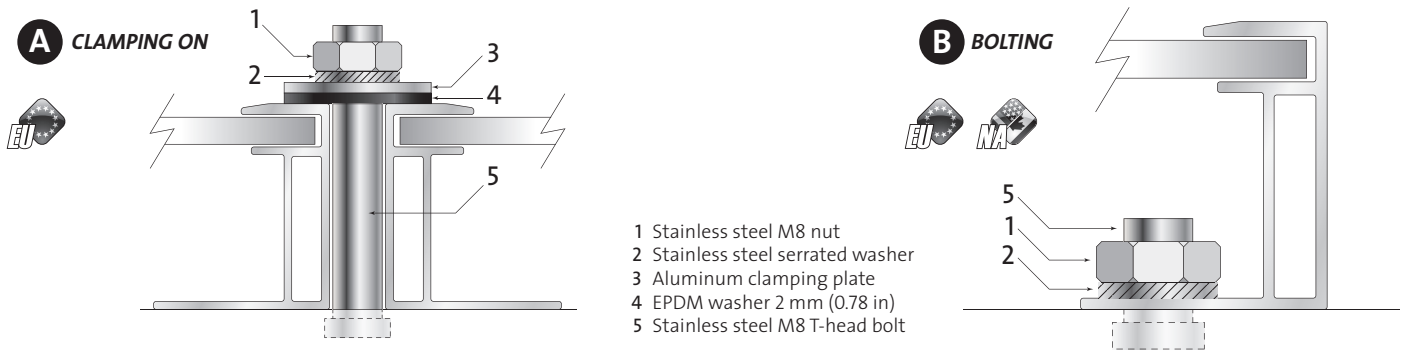
P_{max} (U_{mpp}*I_{mpp}) (W)	Maximum Power Voltage (V)	Maximum Power Current (A)	Short Circuit Current (A)	Open Circuit Voltage (V)
155	22.30	6.97	7.55	28.00
160	22.60	7.08	7.70	28.30
165	22.95	7.19	7.80	28.60
170	23.04	7.38	7.90	28.80
175	23.40	7.48	8.05	29.20
180	23.70	7.60	8.10	29.40
185	23.82	7.77	8.20	29.51
190	24.00	7.92	8.30	29.70
195	24.24	8.08	8.40	29.94

Day4 60MC Series Modules

P_{max} (U_{mpp}*I_{mpp}) (W)	Maximum Power Voltage (V)	Maximum Power Current (A)	Short Circuit Current (A)	Open Circuit Voltage (V)
205	28.42	7.22	7.73	35.41
210	28.69	7.33	7.84	35.75
215	29.08	7.41	7.92	36.03
220	29.36	7.51	8.05	36.23
225	29.47	7.62	8.12	36.48
230	29.52	7.80	8.32	36.71
235	29.77	7.89	8.42	37.90
240	30.03	7.98	8.54	37.12
245	30.29	8.08	8.58	37.32
250	30.55	8.17	8.64	37.54

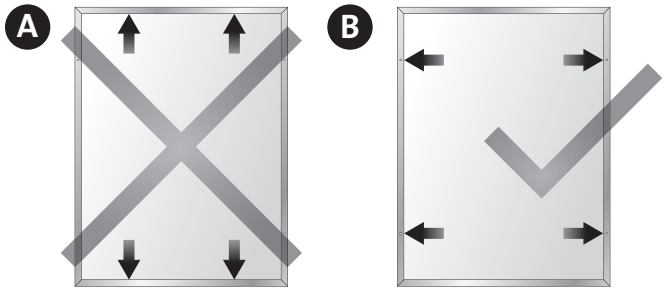
USA: Refer to Section 690-8 of the U.S. National Electrical Code for an additional multiplying factor of 1.25 which may be applicable.

Figure **1**



1 Stainless steel M8 nut
2 Stainless steel serrated washer
3 Aluminum clamping plate
4 EPDM washer 2 mm (0.78 in)
5 Stainless steel M8 T-head bolt

Figure **2**



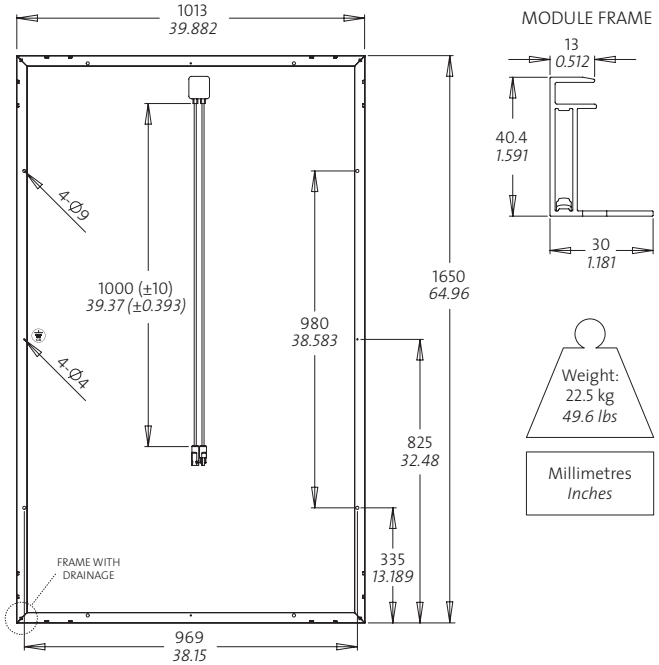
It is recommended that a torque wrench be used for installation. In Figure 1 – Example A the tightening torque (using stainless steel M8 bolts) should be approximately 15-20 Nm (11-15 ft-lb). Use the existing holes for securing the module. Do not drill additional holes as doing so would void the warranty. Use appropriate corrosion-proof fastening materials.

Each module must be securely fastened at a minimum of 4 points. The frame has been stress tested for mounting on the long sides. **The module must not be secured by its short sides.** This method offers maximum loading capacities on the module surface. (See Figure 2)

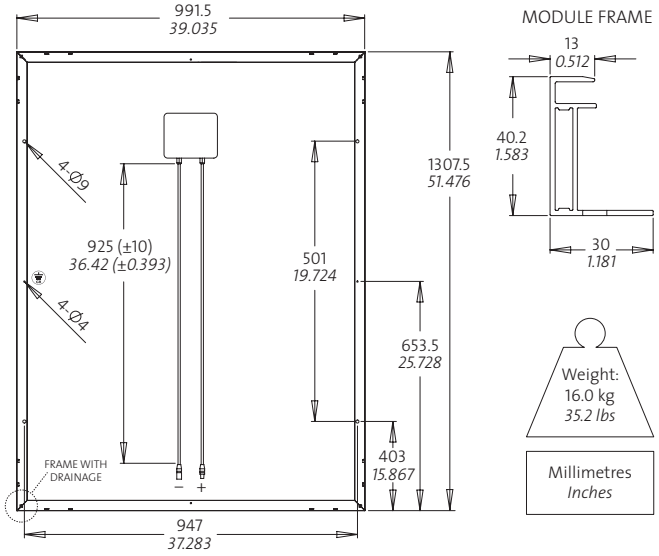
The support points of the mounting racking profiles on which the modules are fastened, e.g., by means of clamp connections must correspond in the distance to each other to the position of the pre-installed mounting holes on the module frames with a divergence of maximum 100 mm.

- *In Europe only:* Day4 Energy modules have been evaluated by third party testing for a maximum positive design loading of 5400 N/m² and a maximum negative design load of 2400 N/m².
- *In Europe only:* Day4 Energy modules have been evaluated for mounting using a clamp-on or a bolting technique (refer to Figure 1 – Example A and B).
- *In USA and Canada only:* Day4 Energy modules have been evaluated by UL for a maximum positive or negative design loading of 1436.4 N/m² (30 lbs/ft²).
- *In USA and Canada only:* Day4 Energy modules have been evaluated for mounting using a bolting technique (refer to Figure 1 – Example B).

60MC-I Module Physical Dimensions



48MC-S Module Physical Dimensions



4-ø4 denotes 4 holes (grounding holes) centered on each edge with a diameter of 4mm (GR) Grounding Hole

4-ø9 denotes 4 holes (mounting holes) with a diameter of 9mm

NOTE: *All dimensions are accurate within ±1.5mm tolerance unless otherwise stated. Product dimensions in imperial inches (conversion of 1mm equals 0.03937in, 1kg equals 2.2lbs) are provided for information purposes only.*

DAY4® ENERGY

Specifications and design are subject to change without notice. The features, functions and appearance of Day4 MC modules may differ from details given due to continual product development. For updated documentation please contact Day4 Energy Inc. or check our website: www.day4energy.com.